Composting and Organic Growing

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Organic Growers Association W.A. (Inc)

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and
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by

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Other Organic Growers Association Publications

J. Conacher (1980, Revised 1986): *Pests, Predators and Pesticides: Some Alternatives to Synthetic Poisons*

J. Conacher (1985): *Small-Scale Farming and Horticulture: Some Theories and Strategies for Organic Growers*

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Preface

This booklet has been prepared for the Organic Growers Association Spring Fair 1980, with the objective of answering some of the questions most frequently asked of the Association ...

> How do I start an organic garden?
> How do I make compost?
> What material is suitable for mulching?
> Which methods best suit W.A. conditions?

A beginner is apt to be overwhelmed by the plethora of books and magazines now available on organic gardening. Many are of course very useful, but for the most part share the disadvantages of being suited to either the Northern Hemisphere or more temperate parts of Australia. It is difficult, for example, to implement versions of the traditional European herbal ley/crop rotation regime outside the milder South Western corner of the State; however, most methods can be applied with some modification and certainly the basic objectives of organics still apply. Similar conditions to W.A. prevail in countries like Israel, Southern Europe and Western U.S.A.; however, much of the information from these places is not yet available in 'popular' organic literature, but is tucked away in scientific journals.

Thus, at present we are dependent on recording the experiences of local growers. Over the past few years, our Association and other Australian organic groups have accumulated some useful hints, some of which we pass on here.

We still need more information. Can you help us? How have you coped with your local soils and local climate? What crops have been successful? What adaptations have you made to water shortages or loss of water quality? Write to us, tell us of your experiences, successes and failures, so that we may help others in a practical way.

Jeanette Conacher
October, 1980

Composting and Organic Growing in Western Australia

Growers in W.A. face a number of problems. These of course will vary depending on which part of the State you live in. Progressively north of Geraldton a sub tropical to tropical regime is experienced which may require certain modifications as to choice of crop, planting seasons and so on. However, most of the recommendations made in this booklet should have general applicability.

Some of the problems faced by W.A. growers include:

1. Porous soils, often denuded of vegetation during dry months; wind and water erosion.
2. Heavy, leaching rains.
3. Extended periods of drought with desiccating winds, prolonged high day temperatures, high soil surface temperatures and sun or wind-burnt plants.
4. Poor water quality, with added chemicals in scheme water and increasing salinity in bores (and the threat of some bores drying up).
5. Food plants not suited to local conditions.
6. Flies!

Under such conditions we need to utilise growing methods which will:

- conserve summer moisture, and reduce soil temperatures and heat stress to plants;
- reduce leaching of essential minerals during heavy winter rains or from Summer irrigation (or summer rains in the north of the State);
- permit relatively easy cultivation of suitable plant species;
- and reduce fly-breeding sites.

Some solutions include:

1. Mulching - a matter of priority in any growing situation. Mulching reduces Summer evaporation, lowers soil temperatures, suppresses weeds, encourages earthworms,

provides a source of organic matter and plant food, stimulates the activity of soil micro-organisms, reduces the problem of water repellency, prevents soil erosion and reduces excess leaching of plant nutrients.

2. Composting also has the same effect as above, but additionally provides a means of recycling waste organic materials and it costs you nothing.

3. Selection of suitable plant species. Avoid water-hungry crops such as silverbeet (grow N.Z. Spinach instead) in Summer. Grow Mediterranean species such as capsicum, eggplant, carob tree, citrus, grapes; experiment with hardy perennials such as the 7 year bean (Dolichus lablab). Plant a native garden in place of lawns - use local species for minimum maintenance and no water. Attract native birds, insects, spiders, lizards etc.

4. Use trickle irrigation on fruit trees, vines and veges. Encourage deep root development by watering deeply once or twice a week in Summer, rather than daily light watering.

5. Provide light shade over veges. Construct a framework and cover with moveable frames of fence pickets, old venetian blind slats, or shade cloth (aim for about 50% shade - run slats N/S direction), or grow vines such as grapes, squash and choko over frames.

6. Ensure that compost heaps reach high temperatures to prevent fly breeding. Don't leave vege scraps and grass clippings unattended. Place fly baits near compost heaps - use a little meat and water in a jar with holes punched in the lid or TUGON bait in icecream containers; treat maggots with lime, derris dust, boiling water, diatomaceous earth, pyrethrum or wood ashes (these act as contact poisons).

There are many ways by which you can add organic matter to the soil, and no single method is necessarily the best. Be prepared to experiment. Obviously a flat-dweller's needs will differ greatly from that of a commercial orchardist - but both will still have the same objective in mind: the return of organic matter to the soil in order to raise healthy plants, animals and people.

Do not be discouraged by failures. Remember that anyone who makes good compost the first time around is either singularly gifted or a good liar. You develop a 'feeling' for organics and in fact one very soon discovers that it stimulates a whole new attitude of mind, extending far beyond the realm of making compost heaps and this is what it is all about, making it so satisfying, rewarding and positive.

The Objectives of Organic Growers

The prime objective is to raise healthy plants, animals and humans in an unpolluted environment, working with nature and not against it. This can be achieved by:

1. Sound crop management - encouraging a diversity of plant, animal and insect species;
2. Use of organic materials - compost, animal manures, green manuring, mulching, crop stubble, sludge, seaweed products and organic industrial residues;
3. Use of natural mineral fertilisers - rock phosphate, dolomite, greensand, crushed granite and basalt;
4. Use of biological control - provision of niches for natural predators, use of low toxin or pest specific sprays (but is spraying really necessary? - see Organic Growers Association *Pests, Predators and Pesticides* booklet), and
5. Change of attitude - don't throw away reusable materials, recycle household and garden wastes; use water wisely, eat wholefoods, grow your own pesticide-free food; investigate the use of biological toilets; be responsible for your own good health and peace of mind.

What is Organic?

Organic in the above context, refers to material which at some time has lived in the form of a plant or animal and which through the processes of death and decay is recycled back to the soil.

This material, the by-product of complex biochemical degradation and microbial synthesis, feeds vast rnicrobial and insect populations which, in the process of feeding, produce new substances able to be utilised by plants; these substances are vital to plant growth, health and reproduction. Plants cannot thrive in a 'dead' soil continually fed with toxic chemicals. In a sense, when we add organic matter to the soil, we are feeding the soil and its organisms, and not the plants.

What is Composting?

Composting has taken place in natural grasslands and on forest floors for millenia; dead leaves, twigs, grasses, roots, animal and insect bodies are all recycled back to the soil and processed into food for plants. In a modified form, it has been practised for centuries by some countries such as China and Japan, where crop, animal and human residues have been methodically returned to the soil. Han Suyin in her book, *The Crippled Tree* (Mayflower, 1968) quotes her illustrious Third Uncle: "Three things are necessary - earth, water and manure. Water from the sky, soil of the earth and manure of man and animal; Excremental waste confirms the harmonious cycle of life, since out of waste comes renewal ... in an agricultural society, dung has its function and natural dignity."

During the 1930's, Sir Albert Howard, a British agronomist working in India, observed that remarkable qualities of resistance developed in plants and animals raised on compost-treated pastures contrasting with the poorer condition of adjacent farms treated with chemical fertilisers. The basic compost heap as we know it today was developed by Howard and promoted in the West during the 1940's by Rodale's organic movement in the U.S.A. (See references: King, Howard and Fukuoka. p.26).

Essentially, composting is a process by which we assemble a variety of organic materials and natural minerals and heap them together to speed up the decomposition process. A complex array of substances are produced - carbohydrates, proteins, antibiotics, hormones, acids, gases, vitamins, minerals and cohesive substances. The end product should be a dark, stable substance which is crumbly to touch, sweet smelling and held together by a black sticky substance called colloidal humus. It also contains an important array of valuable micro organisms. On average, the final product contains about 22% organic matter, 6% soluble humus, 10% nitrogen, 5% potassium and 0.7% phosphorous (Shewell-Cooper, 1975), although Handreck of CSIRO (1978) places the NPK ratio more conservatively at 4:2:1. Compost generally rots down from a carbon/nitrogen ratio of 25-30:1 to 10-14:1 (See C/N ratio, p. 12).

What are Some of the Benefits of Adding Organic Matter to the Soil?

Whether organic matter is added to the soil by composting, mulching, green manuring or via animal manures, several benefits accrue:

1. The addition of organic matter to the soil encourages a dramatic increase in the numbers of soil organisms which decompose this material and produce a wide range of nutrients for plants.

2. Food is available to plants *in the right amounts at the right time*, availability being regulated by soil microbial activity, current temperature and moisture levels and so on. In this manner, plants cannot be "force fed" as with highly soluble chemical fertilisers.

3. The development of strong root systems is encouraged, improving their ability to bring up minerals from lower in the soil profile; the growth of more extensive feeder root systems improves a plant's ability to absorb nutrients.

4. Excess nitrates (so long as animal manures, particularly raw chicken manure, are not applied in excess), phosphates and

other soluble chemicals are not so readily mobilised into water bodies where they cause pollution.

5. Organic matter acts as a kind of water reservoir, holding water until needed by the plant. In combination with surface mulching, water evaporation from the soil is greatly reduced.

6. Weeds are suppressed and soil surface temperatures reduced (remember to cover compost with a mulch).

7. There is a good deal of substantive work now being done which confirms the higher nutritional value of organically grown fruit and vegetables (e.g. the work of Schupen, West German Agricultural Research Station; Uppsala Agricultural University, Sweden; Dpt. Soil Science and Nutrition, University of Missouri, and University of California, Berkeley, (Cox, 1979).

Schupan (in Vogtmann, 1978) in a 12-year study of organic versus chemical plots, demonstrated considerable advantages for veges grown in compost. Higher yields in chemically-raised veges were due to extra water. The following table (p. 10) is instructive.

Vogtmann reports on further studies of chemical vs. organic methods. Stoll (1969) and Saloman (1972) found that increased applications of nitrogen with the objective of increasing yields in grapes and cabbages led to lower quality, decreased colour and poorer texture and storage qualities. Another study from the Florida State University (Cox, June 1979) indicated that too much nitrogen tended to stimulate pest breeding on plants.

The University of Uppsala Study (Petterson, 1976) showed that compost-grown potatoes had lower yields (less water), higher crude protein, better storage qualities, and lower energy/cost inputs. An Austrian study (Schiller, 1971) established a direct correlation between increased applications of chemical fertilisers (over 80 kg/ha) and infertile cows. The Soil Association of England has demonstrated similar results, over several decades, from its experimental farm at Haughley.

Table 1

Influence on various parameters in vegetable composition and yield by fertilisation with NPK (=100%) or farmyard manure compost. Average results of a 12-year study with various vegetables and two soil types (Schupan, 1975).

Component	**Difference Between Fertilisation with NPK (= 100) and FYM**
Nutritionally Promoting	
Dry Matter	+23%
Relative protein	+18%
Ascorbic acid	+28%
Total sugar	+19%
Methionine	+23%
Minerals: K	+18%
Ca	+10%
P	+13%
Fe	+77%
Yield	-24%
Nutritionally Adverse	
Nitrate	-93%
Free Amino acids	-42%
Sodium	-12%

in H. Vogtmann, "Organic Farming Research
in Europe: Effects of Agricultural
Practices on Soil and Plant Quality",
IFOAM Bulletin, No. 24, Ist Quarter, 1978.

How Can We Add Organic Matter to the Soil?

Through:

1. Composting
2. Animal Manures
3. Mulching
4. Green manuring, cover crops, rotations
5. Sewage sludge
6. Organic industrial wastes

What are Some Suitable Organic Materials?

Garden Waste

Soft prunings, lawn clippings, leaves, crop residues, wood ashes, weeds, etc.

Household Wastes

Fruit and vegetable peelings, tea leaves, coffee grounds, egg shells, vacuum cleaner dust, cotton wool, leather, old underfelt, hessian bags, feathers, newspapers, cardboard (without coloured inks - these are toxic) and urine (named by L. Hills as "Household Liquid Activator" - high in nitrogen and potassium, free and always available).

Farm Wastes

Animal manures - pig, horse, cow, goat, poultry (not cat or dog), crop residues, spoilt hay, water weeds (high N), green manure crops.

Industrial Wastes

Wool, cotton shoddy, spent hops, cannery wastes, nut husks, shredded paper, sawdust (preferably from mills), jute waste, fish, abattoir wastes, sewage or municipal wastes (check heavy metal content), fly ash and coal dust.

Others

Seaweed, lupins, pine needles, bark, bracken (high potash), blood and bone, dried blood, crushed bones, peat, herbs, comfrey, hair, sunflowers.

Natural Minerals

Rock phosphate, greensand, crushed granite, basalt or other rocks, dolomite, crushed limestone, kaolin, feldspar.

NOT

Meat, plastic, large woody material (burn), artificial fertilisers, fat or oil, aluminium foil, grease, other synthetic materials.

Check that woodshavings don't come from chemically-treated timber; poultry manure preferably free-range, not from batteries (hens may be treated with hormones, antibioties etc.); that sewage sludge is low in heavy metals (cadmium, lead, mercury), avoid greengrocers' vege scraps - they probably contain chemical residues; mushroom compost is generally treated with fungicides, pesticides; check that hay is free of chemicals.

What are the Basic Rules for Making Compost?

1. **Use suitable materials** - (see list p. 11/12). The final value of compost lies in the quality of material you use. Try and use a variety of materials to ensure a balanced supply of elements and minerals (this is where weeds are so useful). Use anything that has lived before, and no man-made materials. Place diseased materials to the centre of the heap. To start a heap, accumulate sufficient green and dry material to build a heap approximately 1 cubic metre in size. It may take several weeks to build up a heap.

2. **Have the correct Carbon/Nitrogen ratio** - in order to get compost to "work" and to produce a material of high nutritional value, you need to have approximately 25-30 parts by weight of carbon to each part of nitrogen used. Some examples of suitable ratios are:

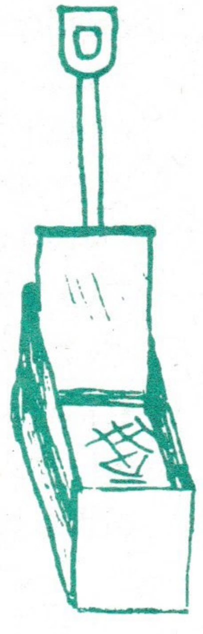
Material	**Proportion**	**C/N ratio**
Lawn clippings, sawdust	12:1	29:1
Lawn clippings, weeds, leaves	2:3:1	28:1
Leaves, sawdust, cattle dung	2:1:2½	26:1
Fruit wastes, lawn clippings	2:1½	29:1
Weeds, paper, chicken litter	4:3:1	27:1
Leaves, weeds, paper, chicken droppings, urine	3:3:1:½:1	28:1

Source: K. Handreck, *Composting*, CSIRO
Discovering Soil Series, No. 3, 1979

A rule-of-thumb method is to have a combination of four parts of moist nitrogenous materials such as grass clippings, weeds, vege peelings, mixed with coarser materials to the ratio of one part of sawdust, shredded straw, prunings, leaves and soft prunings. If a range of carbon/nitrogen materials is not available, refer to the table above for the correct carbon/nitrogen combination, e.g. twelve parts of lawn clippings to one part of sawdust.

Don't be put off by technicalities. You soon develop a sense for the right combinations. The advantage of the above method is that generally an activator in the form of an animal manure or blood and bone is not needed to achieve decomposition. However, it is desirable to use some kind of animal waste to supply and generate a valuable range of micro organisms which are important to the production of a high quality compost.

3. **Shredded material** - whilst shredding is not essential, the decomposition process is greatly accelerated if material can be cut into 5-10 cm lengths, allowing a greater surface of material for decomposer organisms to get to work on. There is no need to invest in expensive shredders (they do deal with a large volume of soft material, but are



inclined to reject fibrous or tough material). Use a rotary mower, a tomahawk or axe, a sharp spade and a wooden box, or garden clippers - any of these should deal adequately with tougher material such as corn and cabbage stalks and prunings.

4. **An activator** - generally a source of nitrogen is added to material to feed nitrogen-hungry bacteria which are active in the early stages of decomposition. Animal manures are used, although there are some proprietary products such as herbal and bacterial innoculants. If the correct C/N ratio is provided, these materials should not be needed. However, one advantage of using animal manures is that additional nutrients are added; and urine is an invaluable activator as well as fertiliser when used on the compost heap.

5. **Moisture** - water is essential to sustain microbial action in composting. Aim for about 50 percent moisture content - the consistency of a squeezed out sponge. If too moist, putrefaction may occur, detected by a sour smell; if too dry, decomposition may cease. A good practice is to cover the heap with old carpeting or sacking. Check regularly for correct moisture content, especially in hot weather.

6. **Air** - a plentiful supply of oxygen is essential to certain bacteria during the early stages of decay. Some oxygen will have been incorporated during the building of the heap, but this supply is rapidly depleted. You can then leave your heap to continue to break down under anaerobic conditions, but this will take a lot longer than if you turn the heap and add more air during the early stages. Faster decomposition can be achieved by turning material after a week, then a month later; speedier compost methods involve turning daily (as with the tumbler) or every few days (Berkeley method).

7. **Heat** - a properly made heap should attain temperatures of 40-60° C. *It is important to try and reach these temperatures* in order to maintain a steady rate of decomposition as well as to

ensure a high mortality rate of disease-causing pathogens, weed seeds and insect larvae. The optimal size of a heap is about 4 feet by 4 feet or no less than one cubic metre. A small heap will not heat up adequately; a larger one may overheat (they have been known to catch fire) and result in the loss of valuable gases, or the mortality of useful bacteria and fungi.

The Heat Cycle: In composting generally three heat cycles are passed through. Below 40° C, mesophilic bacteria and fungi oxidise organic material, and secrete enzymes and moulds that attack proteins, starches and fats. Fresh plant material is broken down into different sugars, acids and enzymes and white moulds will be visible. Demands on oxygen are high and sometimes escaping gases can be detected as an ammonia smell. Remaining nitrogen is converted to nitrate form for later use by plants.

During the second stage of the cycle, thermophilic bacteria (actinomycetes) and fungi are active and decomposition is fastest at this stage with a noticeable reduction in the bulk of material as carbon materials are burnt up through bacterial action. Humic acids and antibiotics are synthesised at this stage, the latter being important in the control of plant diseases.

As the heap cools, mesophilic bacteria reinvade, along with other organisms, and complete the attack on tougher lignins and celluloses. Valuable enzymes, minerals, vitamins and antibiotics are now present.

8. **Use of other materials** - the nutrient value of compost can be increased through the addition of light dustings of natural rock minerals such as rock phosphate, greensand, wood ashes, blood and bone, seaweed and comfrey. For the most part, inorganic minerals are best added to the soil when compost is spread, so as not to upset the natural chemical processes of the compost heap. Lime should not be needed in a heap, as it can cause loss of nitrogen. Apply directly to the soil if conditions are acid.

Some Different Methods of Making Compost

As already indicated, no one method is 'the best'. Your choice will depend on availability of material, size of property, time and energy.

The Indore Heap, N.Z. Bin and other modifications (see pp. 17-25) admirably suit the average suburban block which can produce sufficient grass clippings, weeds, crop residues, leaves and prunings to keep several decent-sized heaps continually in operation. You may wish to cart in extra material in the form of seaweed, animal manures and hay. Larger property owners can build similar heaps and simply elongate them to deal with the larger volume of material. One end of the heap can be in use for the finished product, the other end simultaneously being built with fresh organic material. Material can be turned with a front-end loader. (Two of the largest heaps around Perth are at Government House and the Perth City Council Nursery). Perhaps the main disadvantage of the Indore method is the hard job (but satisfying) of turning the material (although this is not necessary if you want anaerobic composting) and fly breeding - this should not be a problem if you get the heap to reach high temperatures, (keep it covered and use fly baits).

For smaller areas such as home units and flats, some of the commercial plastic compost appliances may be suitable (see Choice magazine, January 1978 for a critical evaluation of the different bins). It is possible to use a plastic rubbish bin to compost daily household scraps (see p.23).

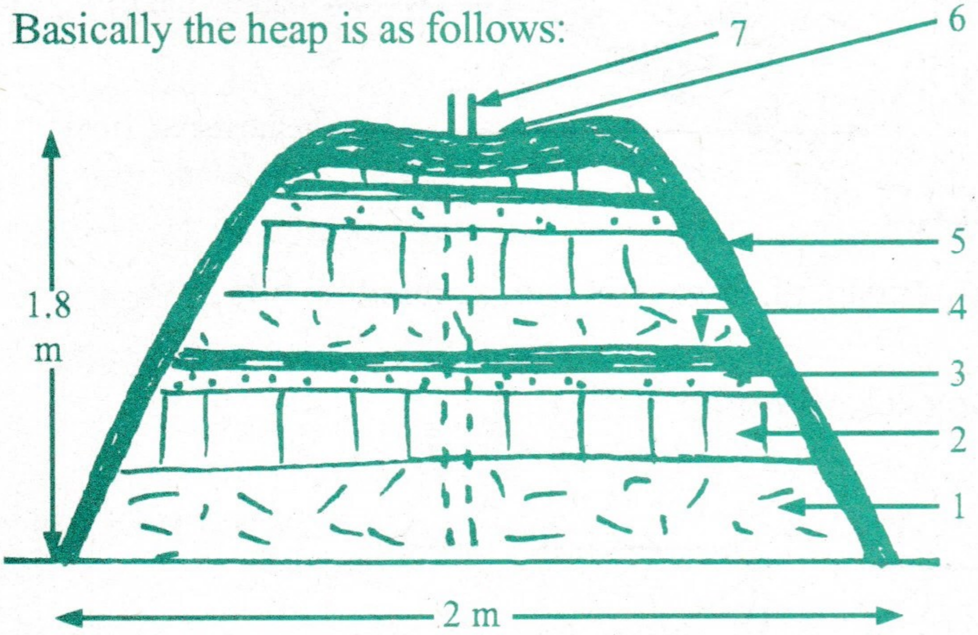
Compost tumblers can produce an excellent product in 14 days enabling a plentiful supply of compost/mulch to be spread around the garden at regular intervals. It tends to function best with green grass clippings/buzzer chip mixture. You need a plentiful supply of clippings and an efficient shredder for good results. One disadvantage is the cost of the tumbler but low-cost tumblers can be made from 44 and 80 gal. drums and work quite satisfactorily (see p.24).

Lawns, trees, vines and veges and pot plants can be successfully fed with foliar sprays made from compost, seaweed and other materials (see p.22).

Indore Compost Heap

Many methods have evolved from Sir Albert Howard's original Indian compost heap. He used this method to encourage the peasant farmers of his State of Indore to use crop residues, animal dung and straw to produce compost for spreading on to the fields.

Basically the heap is as follows:



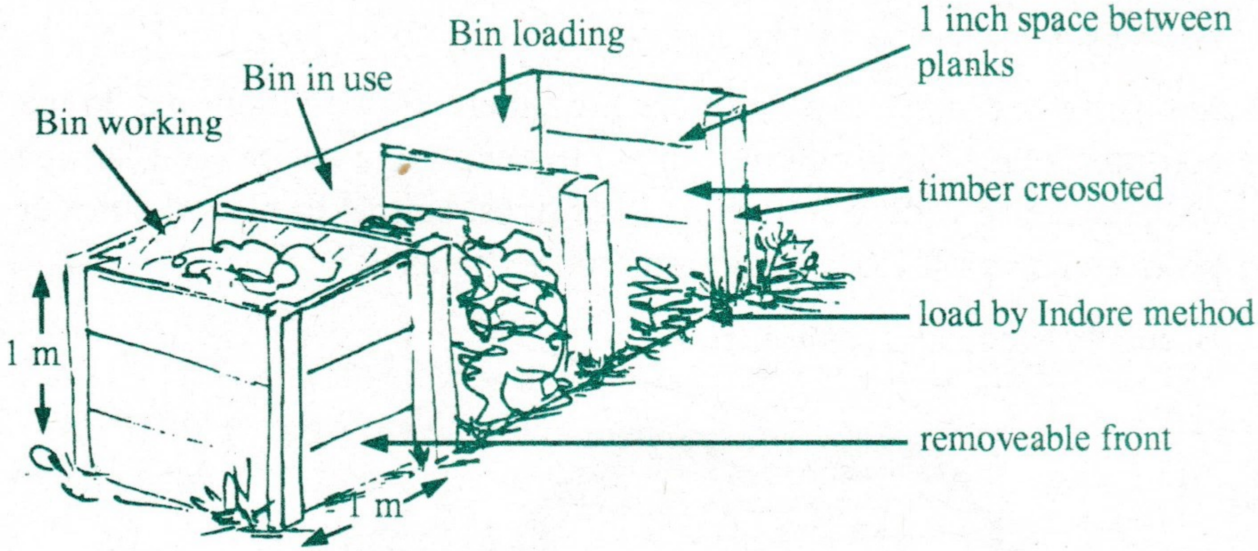
1. 5-6 inches of prunings, coarse material, leaves, straw, corn stalks etc.
2. 5-6 inches green soft materials - grass clippings, weeds, vege wastes, seaweed.
3. 2 inches of animal manure.
4. 1 inch of soil (or old compost) and dusting of rock phosphate, wood ashes.

Repeat the process until approximately 1.8 metres high.

5. Cover with 2 inch layer of soil, or carpet underfelt, or sacking.
6. Flatten top to prevent winter runoff.
7. Punch air vent with pipe.

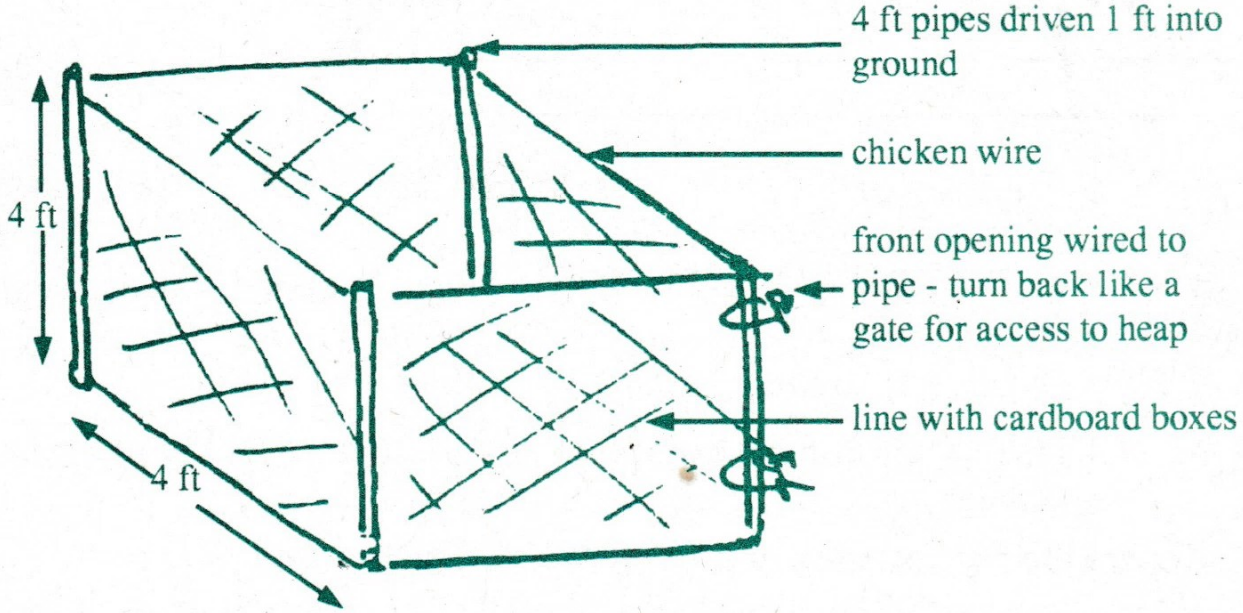
Keep moist. Turn after one week, then again in one month. Ready in 6-8 weeks. Unturned heap will take longer, but quite satisfactory.

The New Zealand Compost Box



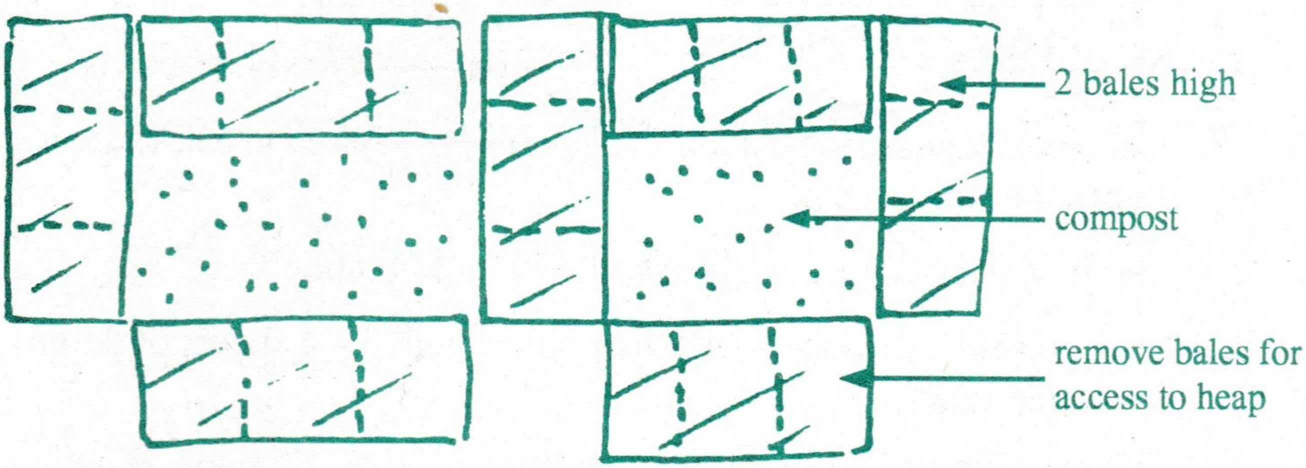
Advantages - permanent, always in use, accessible, tidy.

Bocking Box (Lawrence Hills)


4 ft pipes driven 1 ft into ground
chicken wire
front opening wired to pipe - turn back like a gate for access to heap
line with cardboard boxes
4 ft
4 ft

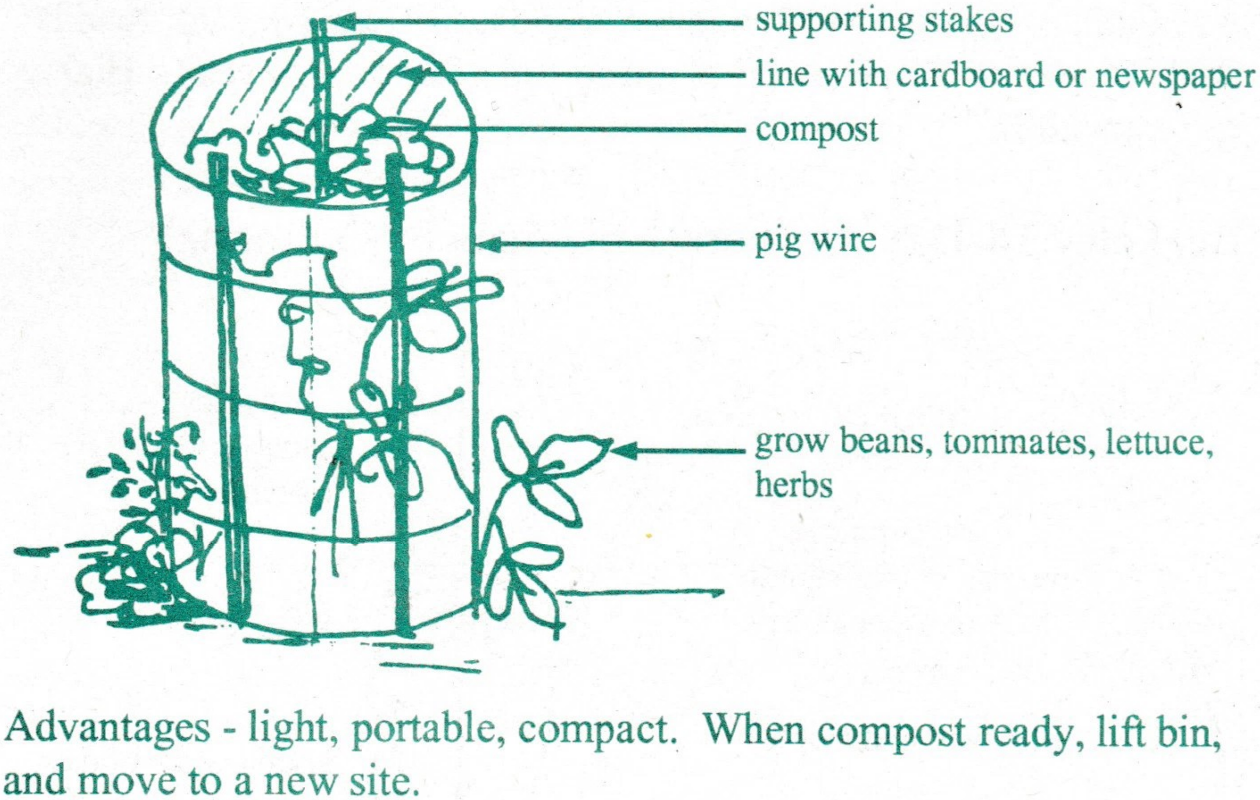
Advantages - moveable, cheap and easy to make. Use also for making LEAF MOULD - fill with leaves, mixing in a few handfuls of rock phosphate, and blood and bone (or poultry manure). Stand for about one year. Excellent potting mix & soil conditioner.

Hay Half Bin



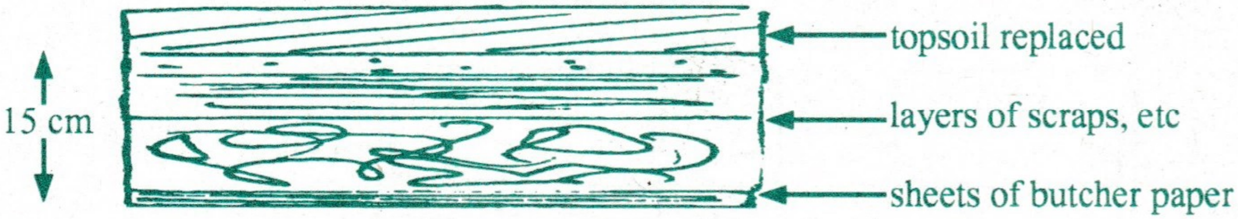
Advantages - Hay bales enable good heating to take place. After several compost cycles, replace bales, old ones will be full of worms, and 'essences' from the heap; put on garden as a high quality mulch.

Californian Bin


supporting stakes
line with cardboard or newspaper
compost
pig wire
grow beans, tommates, lettuce, herbs

Advantages - light, portable, compact. When compost ready, lift bin, and move to a new site.

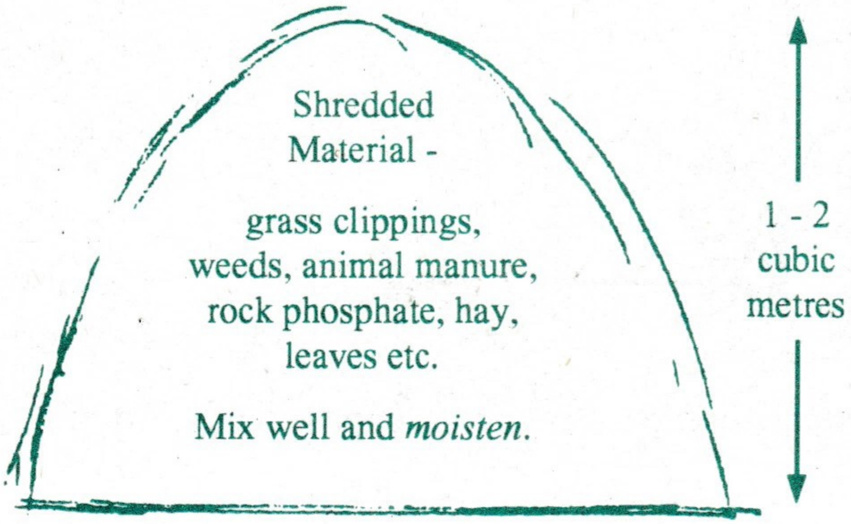
Yvonne Swindell's Easy Sheet Composting and Worm Farm Method



1. Fork and loosen soil.
2. Draw of about 15 cm of topsoil with a dutch hoe.
3. Loosen subsoil with a fork then cover with 3 - 4 sheets of damp butcher paper.
4. Cover with thin layers of kitchen scraps, grass clippings or other green material, soaked manure, seaweed and a handful of rock dust.
5. Recover with the topsoil which was removed. Water regularly.
6. This method creates a perfect forum for earthworms.
7. Plant into this section in 5 -6 weeks .

Advantages - natural worm farm, disposes of daily scraps readily; easily made; no fly problem; plant on top after 5 - 6 weeks. Highly recommended.

Berkeley 14-Day Method (University of California)


Shredded Material -
grass clippings, weeds, animal manure, rock phosphate, hay, leaves etc.
Mix well and *moisten*.
1 - 2 cubic metres

- Turn after 3-4 days and every 2-3 days thereafter
- Keep moist
- Usable after 14 days

Loxton Compost (Loxton Research Centre, S.A.)

45	kg barley or green weeds
40	kg blood and bone (45 kg fowl manure)
1.3	kg hydrated lime
36	litre water
45	kg packing house grape stalks (or leaves)

Shred (use mower). Temperature 65-71°C first 2-3 days; 60°C next 3 days.

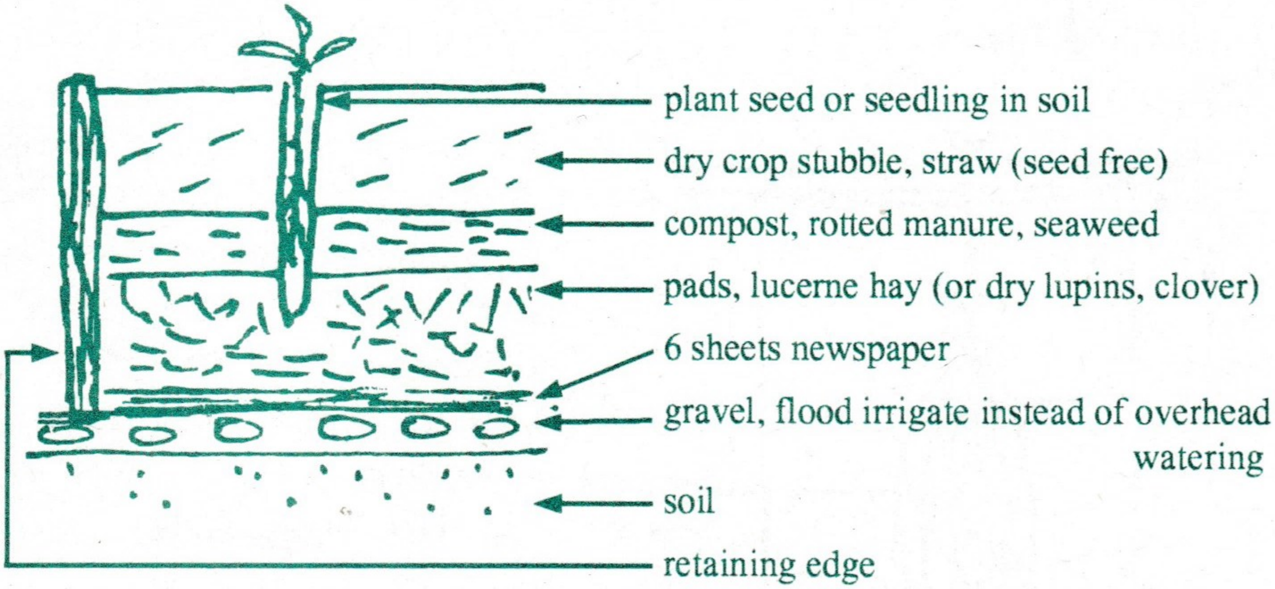
Add 2 kg blood and bone third day if not heating sufficiently.

Turn on fourth day. Keep moist. Turn again seventh day.

Add another 2 kg blood and bone. Turn tenth day, by now cooling off.

Ready to use 14th day.

No Dig Garden (after Esther Deans)


plant seed or seedling in soil
dry crop stubble, straw (seed free)
compost, rotted manure, seaweed
pads, lucerne hay (or dry lupins, clover)
6 sheets newspaper
gravel, flood irrigate instead of overhead watering
soil
retaining edge

Advantages - a good way to start a new garden and allows immediate planting. As plant roots develop, they take advantage of decomposing organic matter.

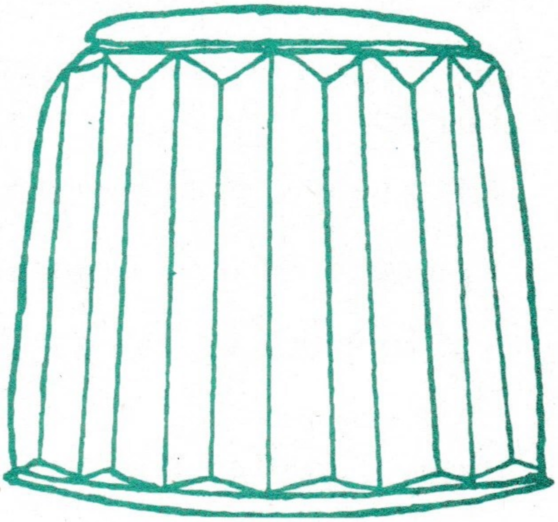
Very little watering needed.

The Gedye Bin

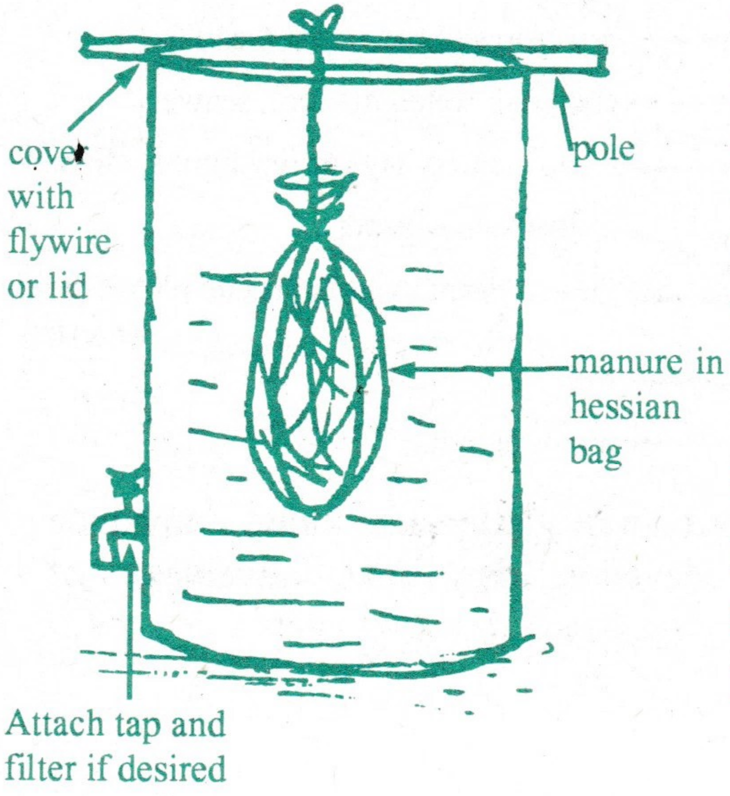
Can be placed anywhere that is convenient provided that it is on soil allowing good drainage and easy access for earthworms.

All biodegradable kitchen waste is suitable for composting. A regular light dusting of dolomite or ground limestone is essential to prevent development of excessively acid conditions. Incorporation of soil and dry material between layers, grass clippings and waste greatly facilitate the process and ensure an excellent friable finished compost.

After curing period the bin is easily lifted off and put in another position.



Liquid Manure



Use one of these

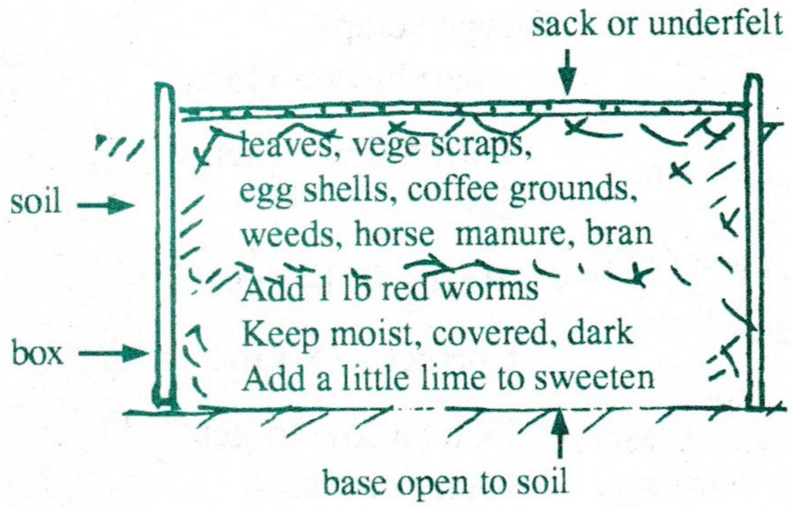
- Seaweed
- Animal manure
- Comfrey
- Nettles
- Mixed weeds
- Compost (141b:20 gal. water)

Stand one month.

Dilute 50/50 or “weak tea” solution.

Don’t use on hot day.

Earthworm Breeder


sack or underfelt
soil
box
leaves, vege scraps,
egg shells, coffee grounds,
weeds, horse manure, bran
Add 1 lb red worms
Keep moist, covered, dark
Add a little lime to sweeten
base open to soil

- Feed every few days with:
  - bran, soaked cardboard pulp
  - apple peelings, chopped vege scraps
  - coffee grounds
  - washed and squeezed out horse manure
- Lift box after 3 months and move to another site.

Use compost and castings on garden or for potting mixes.

For Flat Dwellers

16-20 gal. rubbish bin with holes punched in base and drip tray underneath.

Soak 2 gal. bucket of shredded newspaper (or 1 gal. bucket dried cow manure) 24 hours.

Add 2 handfuls lime, 5 handfuls garden soil, 1-2 lbs worms.

Add daily, chopped (better if put through blender first) vege scraps.

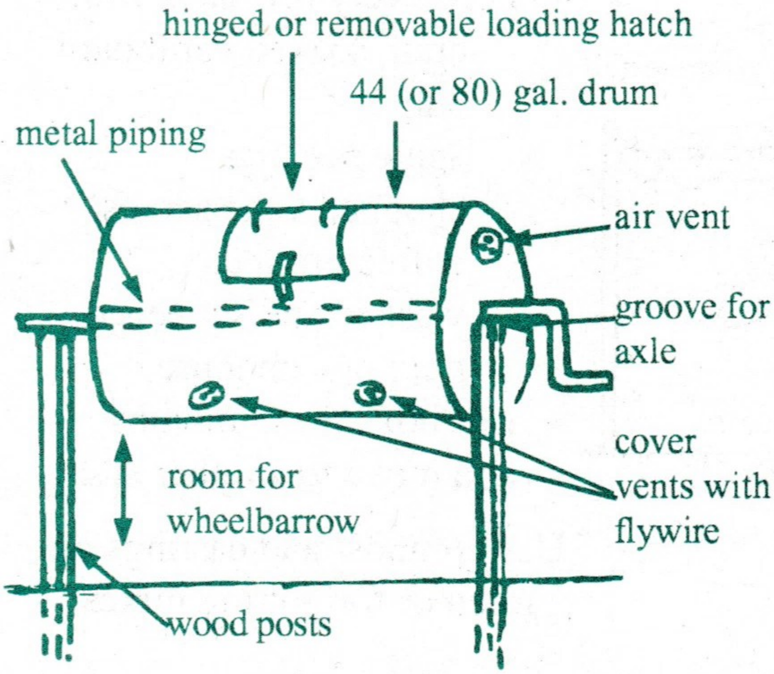
Use worm castings for growing container veges (dwarf tomatoes, squash, carrots, lettuce), herbs, flowers, dwarf fruit trees.

Soiless Earthworm Medium

Soak cardboard (without colour print) in water overnight. Next day, agitate in washing machine. Remove, add small amount shredded newspaper, little clean sand. Add worms and *top feed* with any of following (weekly):

> cornmeal, coffee grounds, dry grass clippings, bran, wheatgerm, chopped vege scraps, sawdust, seed husks, cereal grains, deciduous leaves, hay, horse manure.

Modified Tumbler (Made from recycled materials)



- 4 parts green matter, vege scraps
  1 part buzzer chips
- Turn 5 times each day
- Ready in 14 days
- Correct C/N ratio
- Don't allow to get soggy or sour

Advantages - heats up well. No fly-problem. Compact. Speedy. The product is a partially decomposed mulch which can be lightly incorporated into the soil.

Green Manure Crops

An excellent means of adding organic matter to larger areas. A ready source of essential nutrients, and effective pathogen control. Dig in crop at green stage before flowering and leave 3-5 weeks (phyto-toxic before that time). Increases soil organism activity and improves physical quality of soil.

Use legumes such as: alfalfa, lupins, field peas, clovers, vetches, tick beans, soybean.

Others: mustard, oats, buckwheat, rape, barley, millet, comfrey, weeds (before seeds form).

Add dusting of rock phosphate, wood ashes and an animal manure (or blood and bone) when cultivating in cover crop.

Materials Suitable for Mulches

Hay straw, lucerne	lucerne provides extra nitrogen; straw fewer weeds; light colour reflects sunlight and reduces soil temperature; keeps soil and compost moist; earthworms love it.
Pine needles	a good mulch laid over several layers of newspapers. Place around acid loving plants such as azalea, camellia. Good strawberry mulch.
Sawdust, buzzer chips	try and use from mills rather than joiners (may be chemically treated). Add some blood and bone or chicken manure to reduce N. loss.
Grassclippings	good source N. if placed direct around plants. Stir occasionally to prevent thatching.
Seaweed	an excellent source of trace elements. Cover with straw to keep moist.
Paper	good weed suppressor; keeps down evaporation. (Spread layers around citrus and veges after thorough watering if going away during the Summer). Avoid coloured inks (poisonous).
Stones	keep surface cool, moist, and worms near surface. Place around citrus and fruit trees. Gravels for low maintenance areas but can be very hot. Avoid plastic as it deprives soil and organisms of air and water.
Other	Spent hops, cannery wastes, wool, shredded paper, mulched cardboard, lakeweed, hessian bags, carpet underfelt.

References and Some Useful Reading

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About Organic Growers Association

The Organic Growers Association W.A. (O.G.A) was founded in October 1976 under the name of Doubleday Organic Research Association, that name being changed to O.G.A. in January, 1978.

Its principle objectives are:

1. To promote organic gardening and farming without the use of harmful pesticides and artificial fertilisers.
2. To provide information and practical advice appropriate to W.A.'s semi-arid environment.

Members are offered a Quarterly Magazine, Library, Seed Bank, Field Days, regular Meetings and Lectures.

Membership is $20.00 for 1995, and renewable each November.

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